Asymmetric pollen flow between a native and introduced vine (*Celastrus* spp.)

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Invasion and Hybridization

- Native species can be threatened by hybridization with closely related introduced species
- Rapid declines and extirpation in a few generations

e.g. Cordgrasses (*Spartina*)

USDA-NRCS PLANTS Database

Invasion and Hybridization

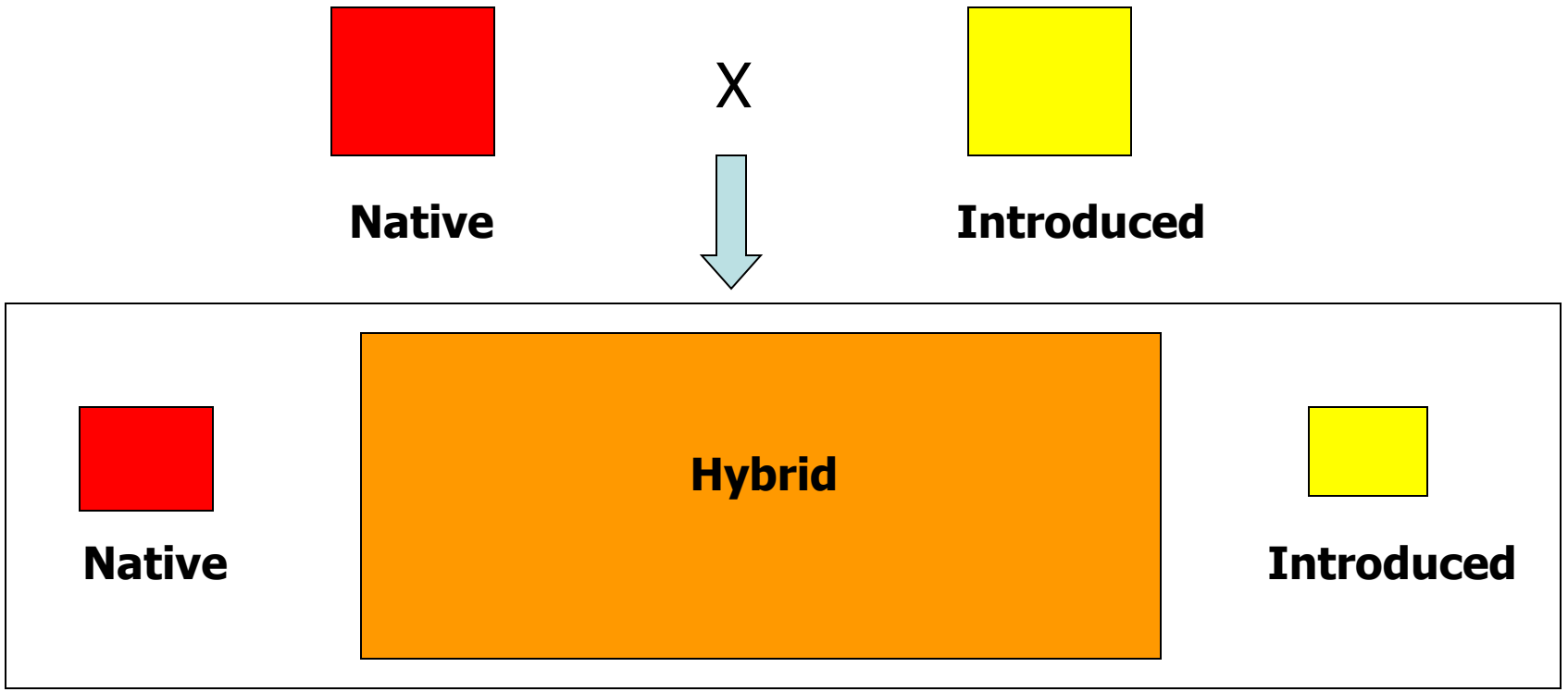
Possible outcomes of pollen exchange:

- Coexistence
- Decline of parental species
  - Hybrid swarms
  - Genetic swamping
  - Seed discounting

How are native species threatened by hybridization?

Hybrid domination

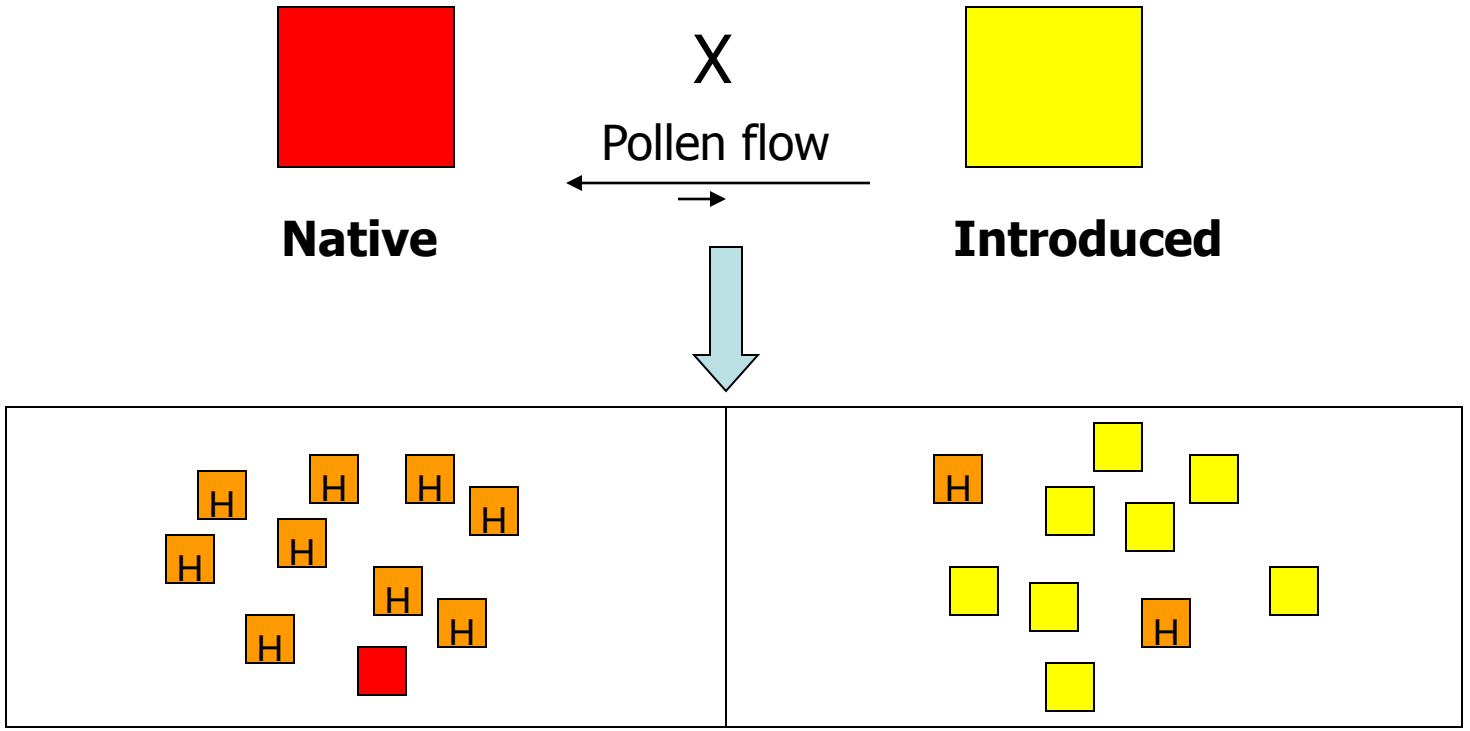
(e.g., Anttila et al. 2000, Ayres et al. 2008)



How are native species threatened by hybridization?

Asymmetric hybridization

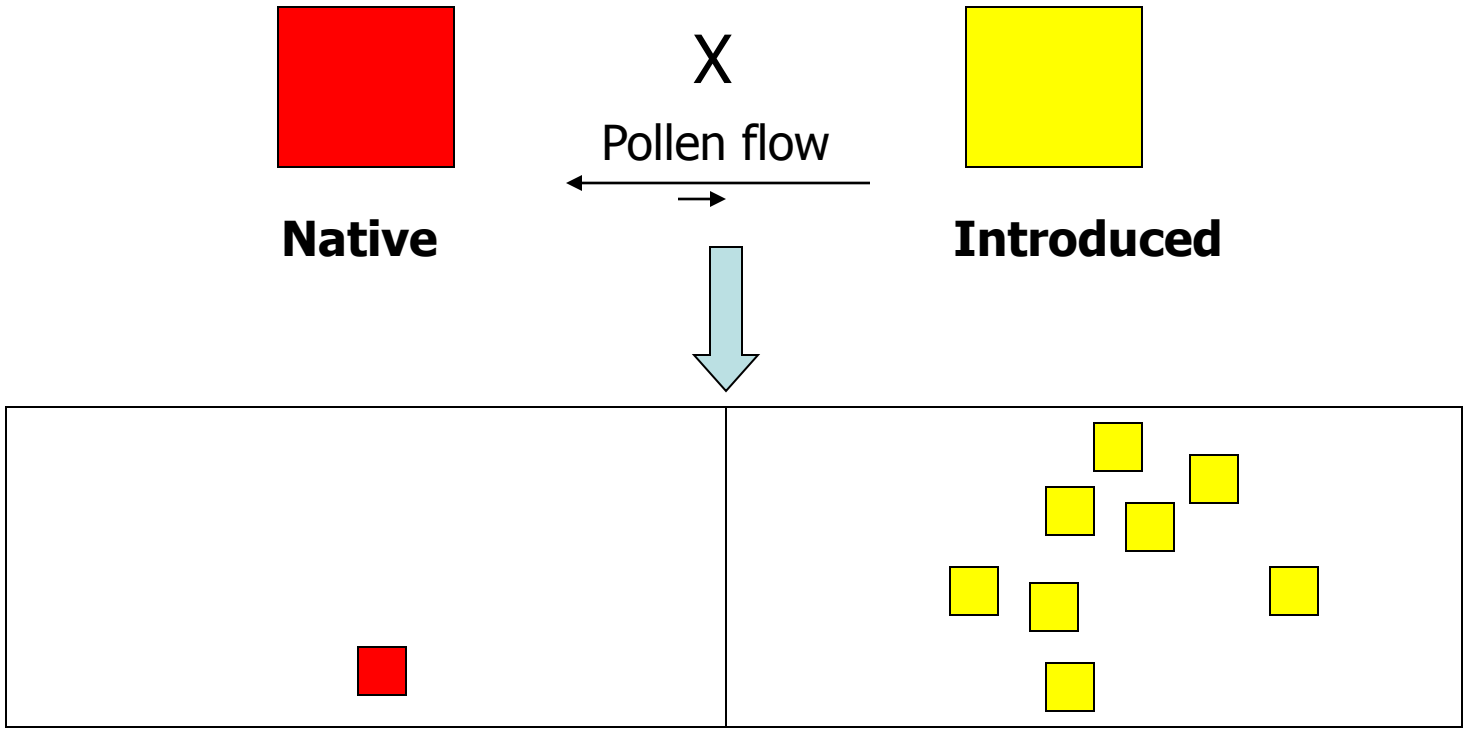
(e.g., Burgess et al. 2005)



How are native species threatened by hybridization?

Seed discounting

(e.g., Prentis et al. 2007)



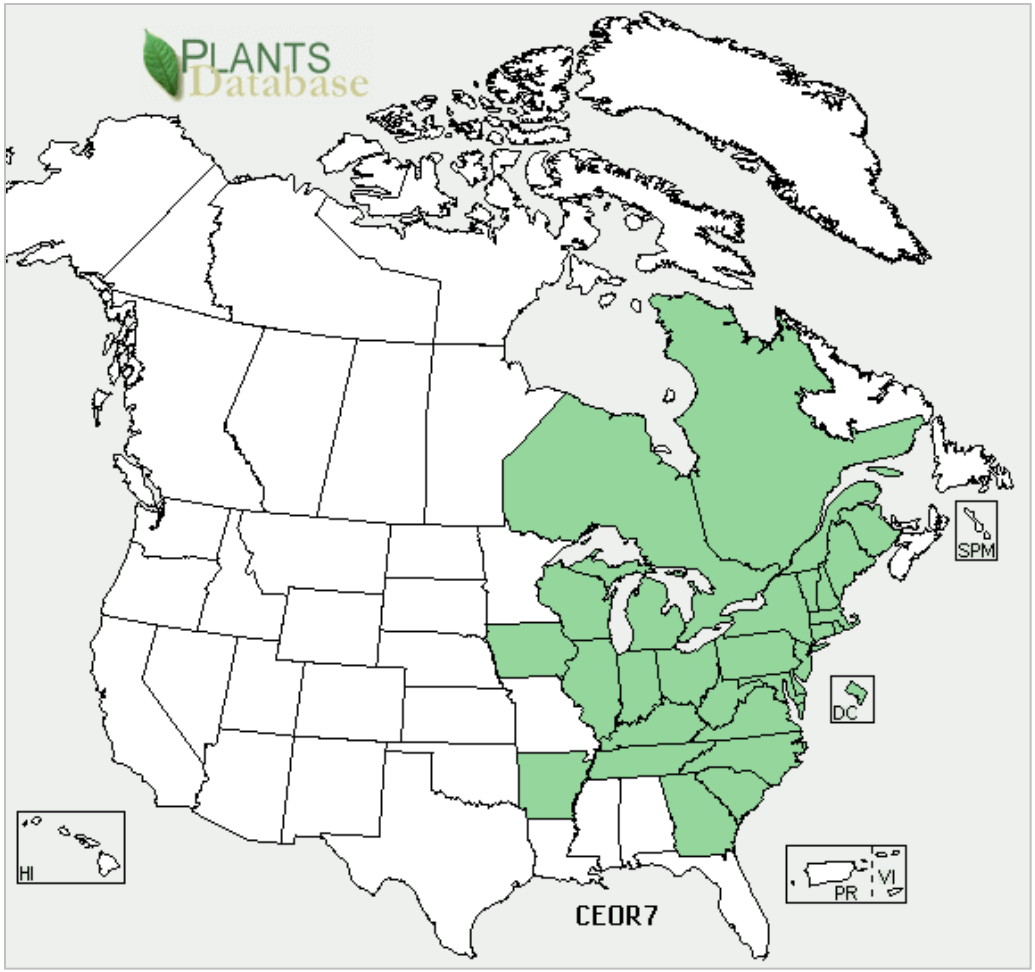
Oriental Bittersweet (*Celastrus orbiculatus*)

- Ornamental vine
- Perennial
- Dioecious

Oriental Bittersweet

Distribution

oriental bittersweet



USDA-NRCS PLANTS Database

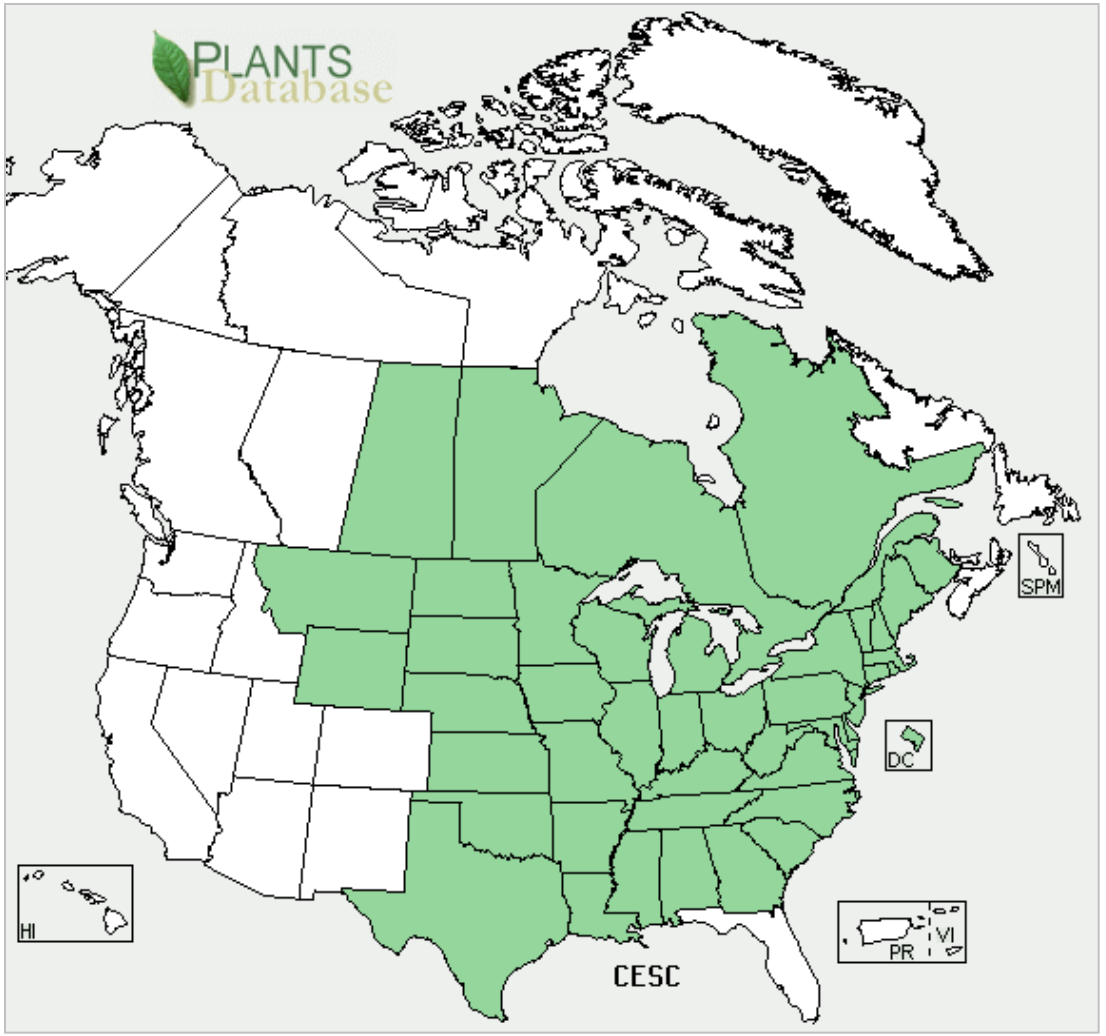
American bittersweet (*Celastrus scandens*)

- Vine native to eastern U.S.
- Perennial
- Dioecious

- Declining where oriental bittersweet is most common

Distribution

American bittersweet



USDA-NRCS PLANTS Database

Questions

- Are reproductive hybrids prevalent?
  - Hybrid domination
- How does fertility change when interspecific pollen is present?
  - Seed discounting
- What is the *rate* of hybridization?
  - Asymmetry

Study Site – east of Ogden Dunes

Observational Study, $n_{Oriental} = 51$; $n_{American} = 46$

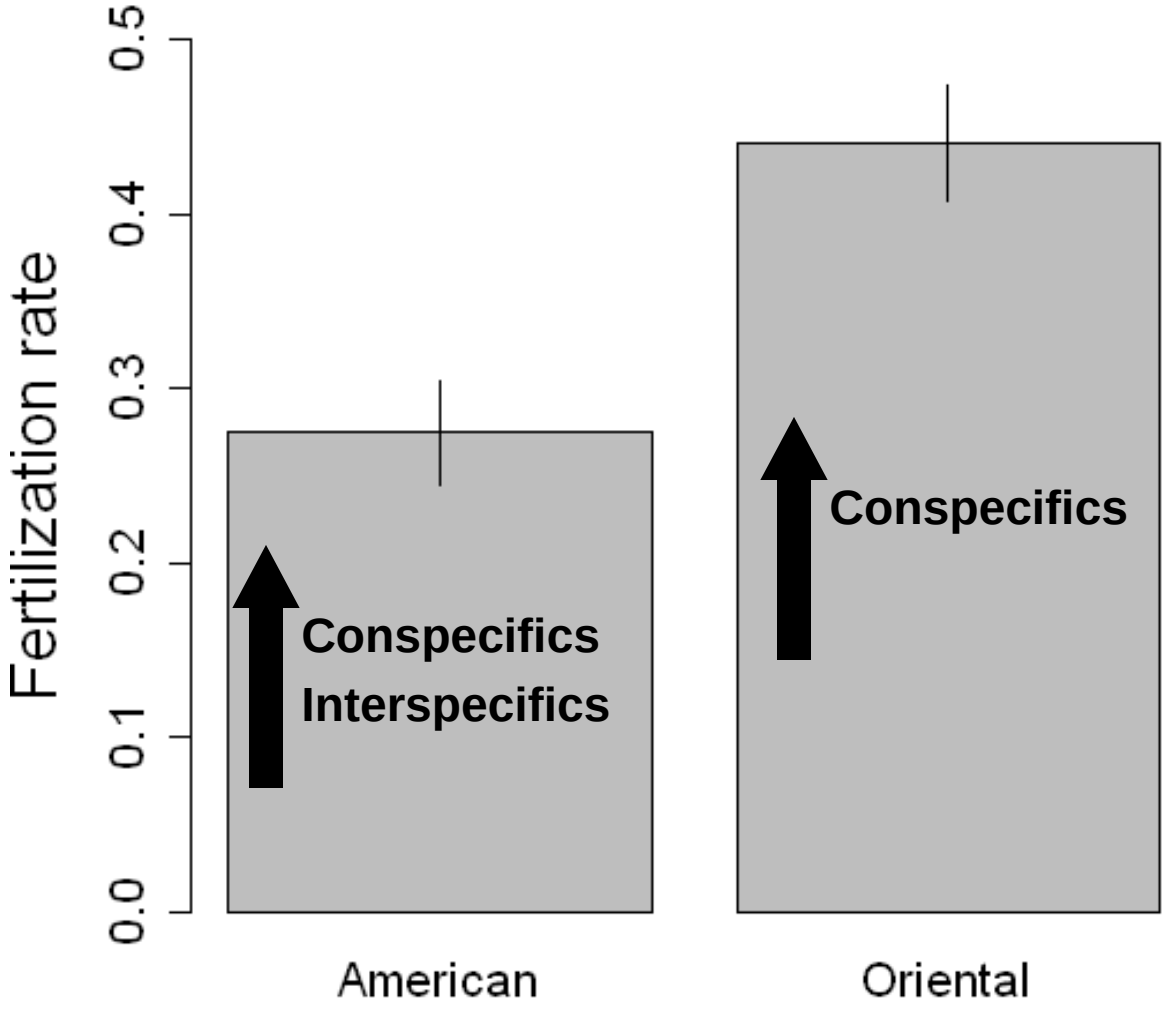
Species identity

- 5 nuclear microsatellite loci
- ‘Pure’ or hybrid?
  - PCA
  - Bayesian clustering
    - *structure*
    - NewHybrids

Adult plant identity

No reproductive hybrids

Fertilization success

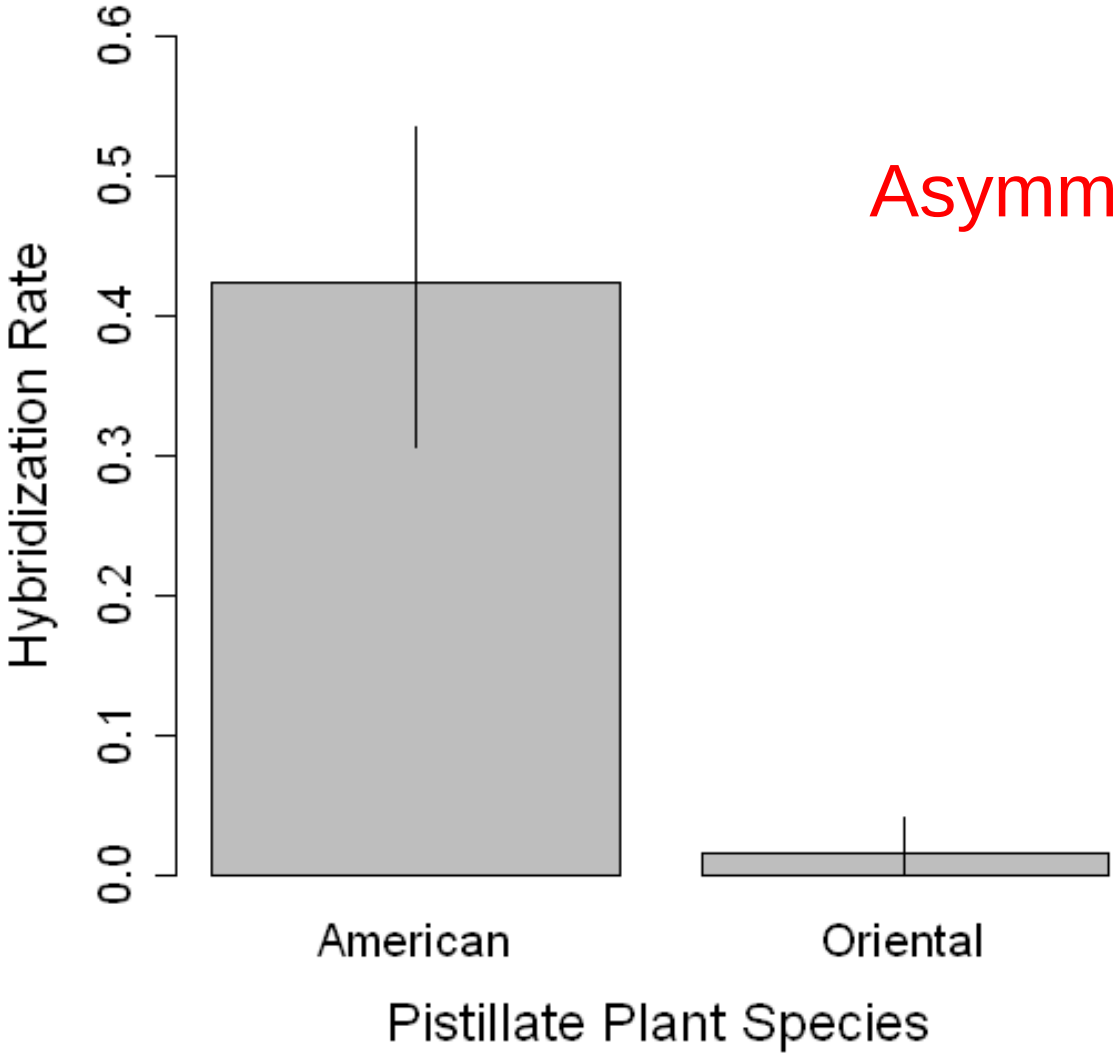


+/- 1 s.e.

n = 716

p < 0.001

Hybrid Seedlings



Asymmetry!

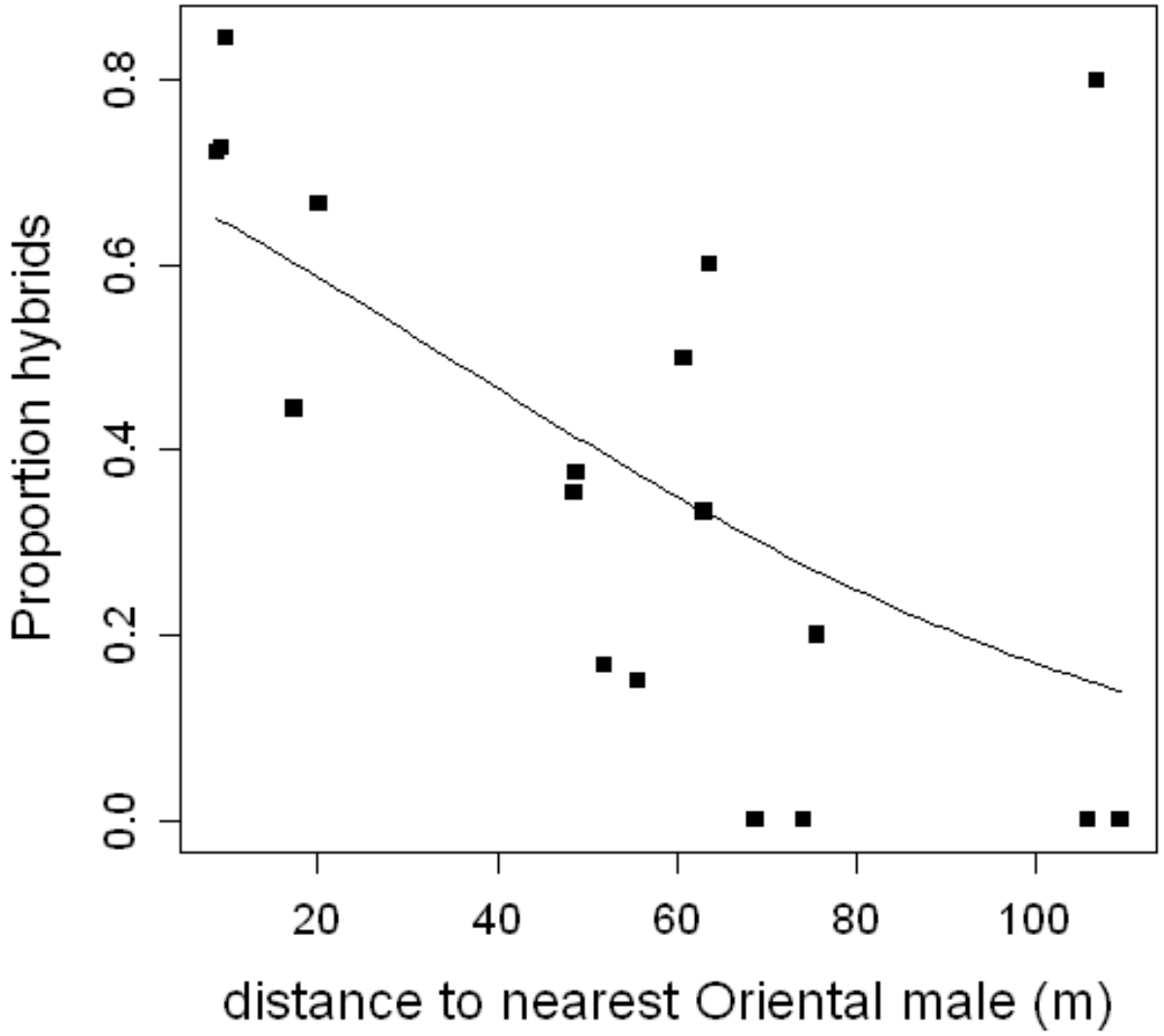
+/- 1 s.e.

n = 275

p < 0.001

Correlates with Hybridzation

American bittersweet



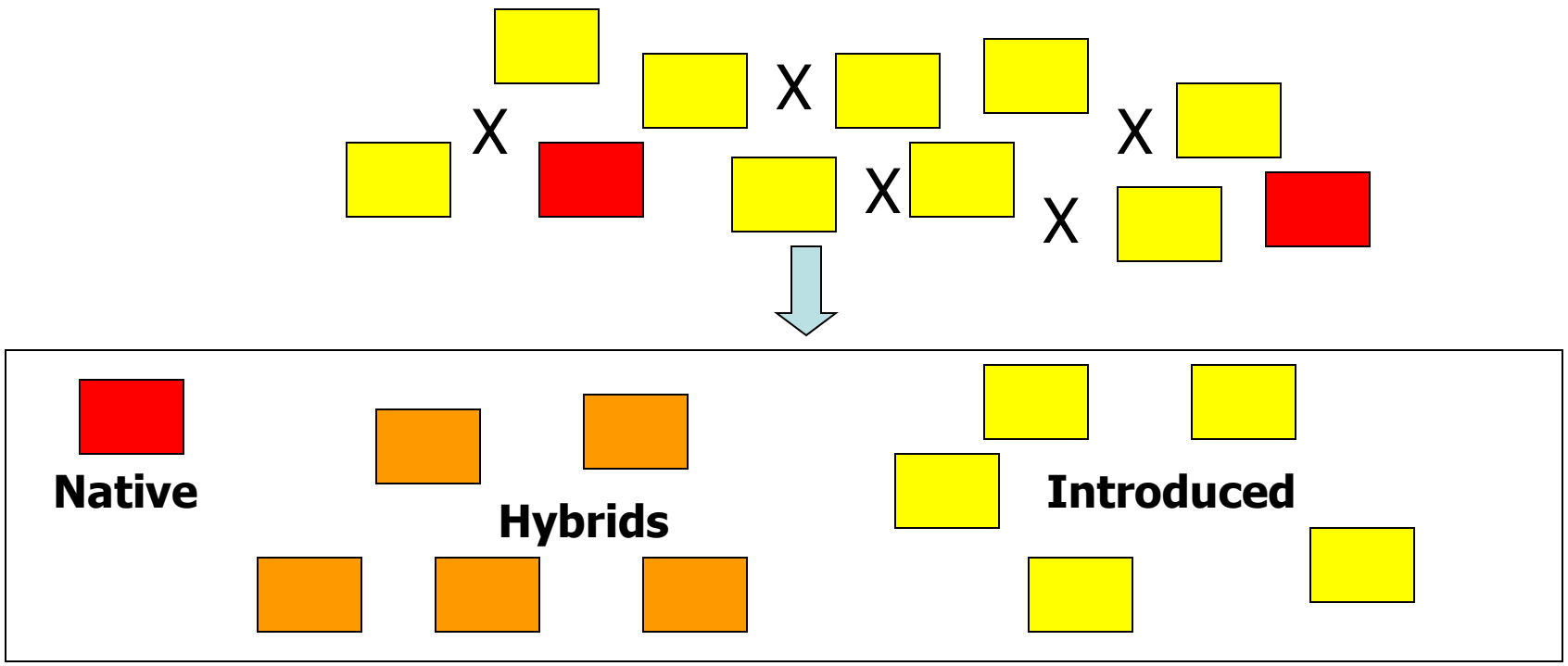
n = 18

p < 0.001

Mechanisms of asymmetry

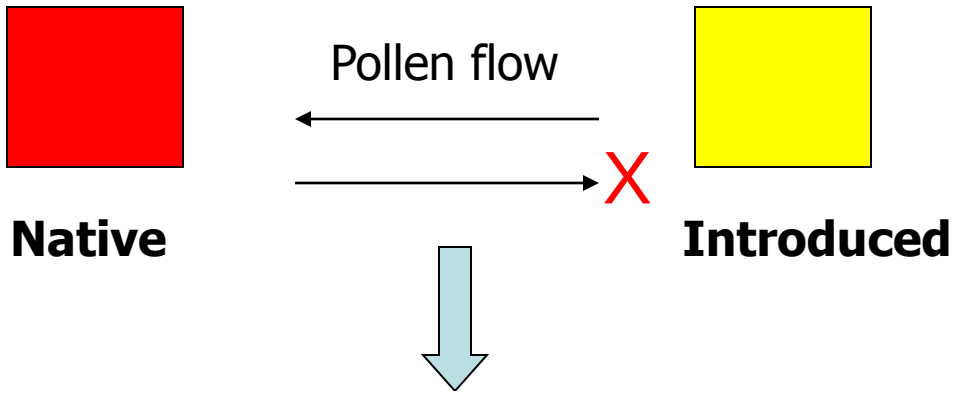
Pollen swamping

(Rhymer & Simberloff 1996)



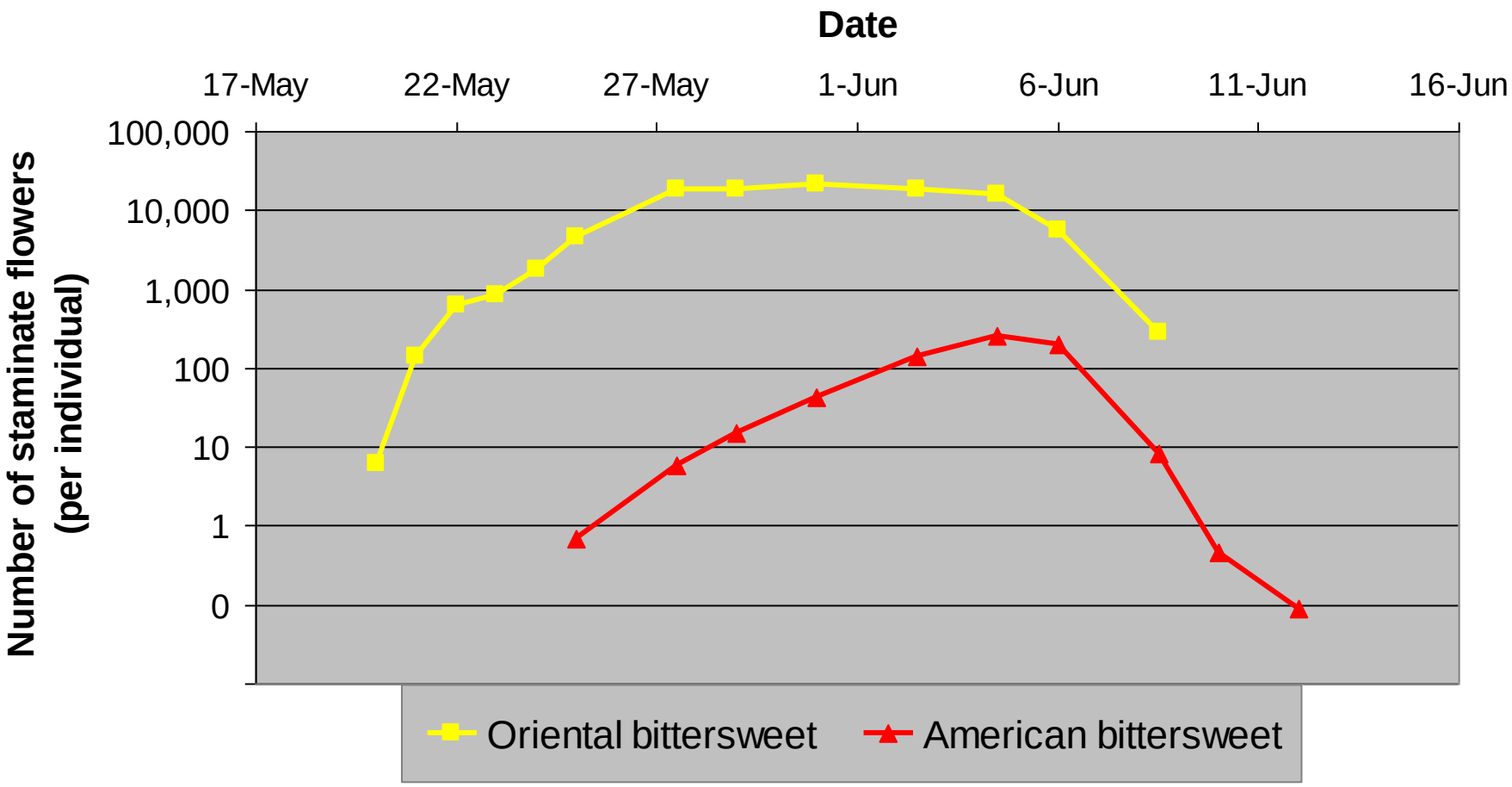
Mechanisms of asymmetry

Interspecific pollen rejection



Pollen swamping

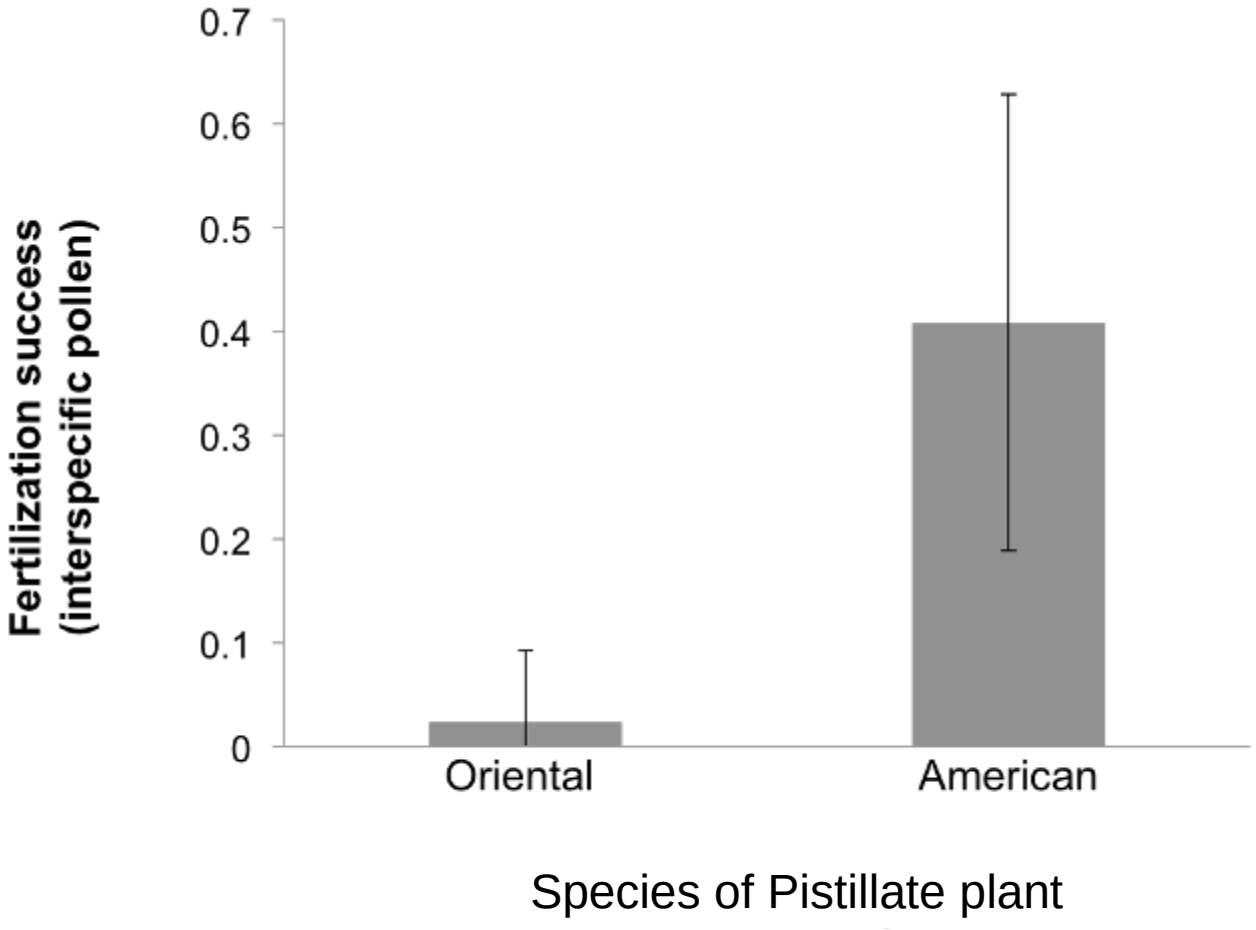
male fecundity



~200-fold advantage for oriental bittersweet

Hand-cross results

interspecific pollination



+/- 1 s.e.

n = 10

p < 0.001

Intra-specific pollination rate greater for Oriental bittersweet (data not shown)

Results summary

- No reproductive hybrids
- Fertilization success increases with:
  - Conspecific pollen availability (both species)
  - Interspecific pollen availability (American bittersweet)
- Asymmetry in hybridization, & mechanisms
  - American bittersweet – 42%
  - Oriental bittersweet – 1.5%
- American bittersweet hybridization rate & distance to nearest Oriental bittersweet

Implications

- Reproductive interference is a problem (even in the absence of hybrid adults)

- Decline in American bittersweet imminent UNLESS nearby Oriental bittersweet are removed

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